Claims

[1] An automated cross-connect system suitable for use in a telecommunication network in a central office including a network of communication lines for connecting subscriber locations to a central office exchange 112, said communication lines extend to the subscriber locations from a main distribution frame (MDF) 320 that comprises a plurality of termination means housed therein for terminating the communication lines from to the subscriber locations and the lines from the exchange, such that the automated cross-connect system is capable of establishing a plurality of cross-connects for completing connections of the communication lines and **characterized in that,**
the plurality of cross-connects are mounted on modular cross-connect boards having switching means that are connected to the plurality of termination means, and wherein automation of the MDF 320 is achieved by selectively controlling the connection state of the plurality of cross-connects remotely via the central office.

[2] An automated cross-connect system according to claim 1 wherein the remote computer terminal (350,352) communicates with a site controller 332 supervising the MDF to identify cross-connection boards and direct the switching means for the appropriate cross-connects.

[3] An automated cross-connect system according to claim 2 wherein the site controller 332 is linked to the cross-connection boards via a communication link that also provides power the switching means for operating the cross-connects.

[4] An automated cross-connect system according to any one of the above claims wherein the modular cross-connect boards comprise a switch matrix of sliding contact sledges that are moved into position by an electric motor.

[5] An automated cross-connect system according to any one of the above claims wherein the switch matrix comprises a plurality of electrically conductive contacts are disposed on multiple PCBs by which any input line can connectable to any output line is achieved by the moving the sledges along different paths and transport planes.

[6] An automated cross-connect system according to any one of claims 4 or 5 wherein the switch matrix further includes:
a bypass cross-connect for each line for bypassing the switch matrix if, upon installation of the cross-connect board, there is a pre-existing cross-connect made e.g. by jumper wire for the line, and

a reset position for each line for preserving an open line condition that is used when there is no jumper wire installed for the line upon installation of the cross-connect board or when the line is disconnected or removed.

[7] An automated cross-connect system according to any one of the above claims wherein the cross-connect boards are mounted in a center stage interconnecting the line side and exchange side communication lines within the MDF cabinet.

[8] An automated cross-connect system according to any one of the above claims wherein the remote computer terminal communicates with the site controller via the Internet, Ethernet, or LAN using TCP/IP based protocol, said remote computer terminal running network management application software (NMS) capable of selectively actuating all cross-connects within the system, verifying line connections, and running trouble shooting diagnostics.

[9] An automated cross-connect system according to claim 8 wherein the NMS automatically checks, verifies, and establishes line connections in accordance with standard operator procedures.

[10] An automated cross-connect system according to claim 1 wherein the cross-connection boards are installed in MDFs with pre-existing cross-connections established by jumper wires without disrupting the existing connections.

[11] An automated cross-connect system according to any one of claims 1 wherein the plurality of cross-connect boards are further located in street cabinets 328 and drop point sites 330 that are in communication with the site controller in a manner such that the plurality of cross-connects are selectively controlled by the remote computer terminal.

[12] An automated cross-connect system according to claim 11 wherein the site controller communicates with the street cabinets and drop point sites via modems coupled to a communication link, and wherein power for actuating the cross-connects is supplied over the link.

[13] A method of automating cross-connects using an automated cross-connect system in a telecommunication network including a network of communication lines for connecting subscriber locations to a central office exchange 112, said communication lines extend to the subscriber locations from a main distribution frame (MDF) 320 that comprises a plurality of termination means housed therein for terminating the communication lines from to the subscriber locations and the lines from the exchange, the method is **characterized** in the steps of,

entering into a remote terminal 352 information related to making a desired connection for activating, removing, or modifying a subscriber communication line;
determining the appropriate central office MDF;
checking the current allocated resources relating to the MDF from a database;
selecting an available communication line for connection to the exchange; and
transmitting a command to the MDF comprising of a plurality of cross-connect boards connected to said termination means wherein a specific cross-connect board and cross-connect thereon is identified and selected to automatically activate, remove, or modify the subscriber line.

[14] A method according to claim 13 wherein in the determining step the information is sent to a system gateway 354 which determines whether the subscriber communication line is accessible through the automated telecommunication system.

[15] A method according to claim 13 wherein the remote terminal is a computer running network management application software (NMS) transmits commands to a site controller 332 that supervises the MDF to identify and select cross-connect boards and direct the switching means for operating the cross-connects.

[16] A method according to claim 15 wherein the site controller transmits commands to the cross-connection boards via a communication link that provides power to the cross-connect boards.

[17] A method according to claim 13 wherein the cross-connection boards are modular and comprise a switch matrix of sliding contact sledges that are moved into position by electric motors.

[18] A method according to claim 13 wherein the system is scalable to the growth in subscriber lines within the MDF by installing additional cross-connection boards.

[19] A method according to claim 13 wherein the remote terminal communicates with the site controller via the Internet, Ethernet, or LAN using TCP/IP based protocol.

[20] A method according to any one of claims 15 or 16 wherein cross-connect boards contained in street cabinets and drop point sites are automated for control by the remote computer terminal via the site controller, in which signals are transmitted and received via modems coupled to communication link.

[21] A method according to claim 13 wherein the NMS automatically tests, verifies, and documents current line connections in accordance with standard operator procedures.

[22] A method according to claim 13 wherein the installation of the cross-connect boards into the termination means is non-intrusive and does not disrupt the existing connections.

[23] A method according to claim 13 wherein in the transmitting step, a database is updated in accordance with the command for the associated the cross-connect.

[24] A method according to claim 15 wherein when the route to the selected cross-connect is 'blocked' due to existing connections on the cross-connect board and stage levels such that the site controller determines an alternative route for reaching the cross-connect while maintaining the existing line connections.